

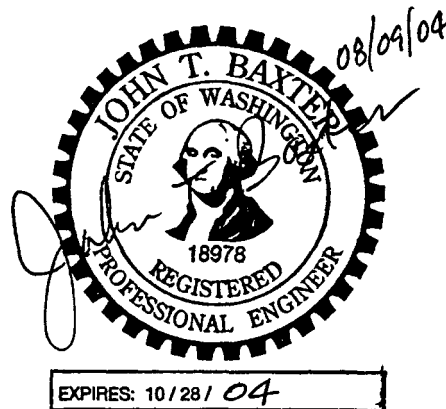
**IQRPE REVIEW
OF
HIGH-LEVEL WASTE (HLW) FACILITY RADIOACTIVE LIQUID WASTE
DISPOSAL SYSTEM (RLD) VESSELS RLD-VSL-00002, -00007 & -00008**

"I, John T. Baxter have reviewed, and certified a portion of the design of a new tank system or component located at the Hanford Waste Treatment Plant, owned/operated by Department of Energy, Office of River Protection, Richland, Washington. My duties were independent review of the current design for the High-Level Waste (HLW) Facility Radioactive Liquid Waste Disposal System (RLD) Vessels RLD-VSL-00002, -00007 & -00008 as required by The Dangerous Waste Regulations, namely, WAC 173-303-640(3) applicable paragraphs, i.e., (a) through (g)."

"I certify under penalty of law that I have personally examined and am familiar with the information submitted in this document and all attachments and that, based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment."

The documentation reviewed indicates that the design intent fully satisfies the requirements of the WAC.

The attached review is nine (9) pages numbered one (1) through nine (9).



John T. Baxter 08/09/2004
 Signature Date
 24590-CM-HC4-HXYG-00138-02-00043, Rev. 00A

**STRUCTURAL INTEGRITY ASSESSMENT
OF THE HIGH-LEVEL WASTE (HLW) FACILITY RADIOACTIVE LIQUID WASTE
DISPOSAL SYSTEM (RLD) VESSELS
RLD-VSL-00002, -00007 & -00008**

**COGEMA-IA-068
Rev. 0**

Please note that source, special nuclear and byproduct materials, as defined in the Atomic Energy Act of 1954 (AEA), are regulated at the U.S. Department of Energy (DOE) facilities exclusively by DOE acting pursuant to its AEA authority. DOE asserts, that pursuant to the AEA, it has sole and exclusive responsibility and authority to regulate source, special nuclear, and byproduct materials at DOE-owned nuclear facilities. Information contained herein on radionuclides is provided for process description purposes only.

<p>High-Level Waste (HLW) Facility Radioactive Liquid Waste Disposal System (RLD) Vessels RLD-VSL-00002/-00007/ and -00008</p>	<p>COGEMA-IA-068, Rev. 0</p>
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<p>Scope</p>	<p>Scope of this Integrity Assessment</p>	<p>The scope of this integrity assessment includes the High-Level Waste (HLW) Radioactive Liquid Waste Disposal System (RLD) Vessels RLD-VSL-00002/-00007/ and -00008. These vessels are components in the liquid waste disposal system that receives radioactive effluents from the process operations in the HLW Building.</p>
<p>References</p>	<p>Drawings, Material Requisitions, and Mechanical Systems Data Sheets</p>	<p>24590-HLW-P1-P01T-P0001, Rev. 5, HLW Vittrification Building General Arrangement (Permit) Plan at El. - 21'-0"; 24590-HLW-P1-P01T-P0002, Rev. 2, HLW Vittrification Building General Arrangement (Permit) Plan at El. 0'-0"; Material Requisition No. 24590-CM-MRA-MVA0-00018, Rev. 1, Pressure Vessels, High Alloy, Shop Fabricated, Medium (N132) Off-gas (OCI), Section 2 – Technical Specifications (Rev. 5, August 19, 2003), including Supplement –S0001 and –S00002; 24590-HLW-MV-RLD-00002, Rev. 0, Equipment Assembly HLW Offgas Drains Collection Vessel RLD-VSL-00002; Mechanical Systems Data Sheet: Vessel, 24590-HLW-MVD-RLD-00008, Rev. 1, HLW Offgas Drains Collection Vessel RLD-VSL-00002; Plant Item Material Selection Data Sheet, 24590-HLW-N1D-RLD-P0013, Rev. 0, Offgas Drains Collection Vessel RLD-VSL-00002 (HLW); Material Requisition No. 24590-QL-MRG-MVA0-00002, Rev. 1, Pressure Vessels, Shop Fabricated, Medium (VXLR), MR Section 2 – Technical Specifications (September 29, 2003), including Supplement – S0004; 24590-HLW-MV-RLD-00003, Rev. 1, Equipment Assembly Acidic Waste Vessel RLD-VSL-00007; 24590-HLW-MV-RLD-00004, Rev. 1, Equipment Assembly Plant Wash and Drains Vessel RLD-VSL-00008;</p>

High-Level Waste (HLW) Facility Radioactive Liquid Waste Disposal System (RLD) Vessels RLD-VSL-00002/-00007/ and -00008		COGEMA-IA-068, Rev. 0
References	Mechanical Systems Data Sheet: Vessel, 24590-HLW-MVD-RLD-00005, Rev. 2, Acidic Waste Vessel RLD-VSL-00007; Mechanical Systems Data Sheet: Vessel, 24590-HLW-MVD-RLD-00007, Rev. 2, Plant Wash and Drains Vessel RLD-VSL-00008; Plant Item Material Selection Data Sheet, 24590-HLW-N1D-RLD-P0001, Rev. 0, Acidic Waste Vessel RLD-VSL-00007 (HLW); Plant Item Material Selection Data Sheet, 24590-HLW-N1D-RLD-P0006, Rev. 0, Plant Wash and Drains Vessel RLD-VSL-00008 (HLW); 24590-HLW-3YD-RLD-00001, Rev. 0, System Description for HLW Radioactive Liquid Waste Disposal (System RLD); System Description Change Notice (SDCN) No. 24590-HLW-3YN-RLD-00001 for 24590-HLW-3YD-RLD-00001, Rev. 0; SDCN No. 24590-HLW-3YN-RLD-00002 for 24590-HLW-3YD-RLD-00001, Rev. 0; SDCN No. 24590-HLW-3YN-RLD-00003 for 24590-HLW-3YD-RLD-00001, Rev. 0	

Summary of Assessment

For each item of "Information Assessed" (i.e., Criteria) on the following pages, the items listed under "Source of Information" were reviewed and found to furnish adequate design controls and requirements to assure the design intent fully satisfies the WAC requirements.

High-Level Waste (HLW) Facility Radioactive Liquid Waste Disposal System (RLD)
Vessels RLD-VSL-00002/-00007/ and -00008

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Information Assessed	Source of Information	Assessment
<p>Design</p> <p>Vessel design standards are appropriate and adequate for the vessel's intended use.</p>	<p>Drawings, Material Requisitions and Mechanical Systems Data Sheets listed above under References; 24590-WTP-3PS-MV00-T0001, Rev. 1, Engineering Specification for Pressure Vessel Design and Fabrication; Specification Change Notice (SCN) No. 24590-WTP-3PN-MV00-00006 for Engineering Specification for Pressure Vessel Design and Fabrication; 24590-WTP-3PS-MV00-T0003, Rev. 1, Engineering Specification for Pressure Vessel Fatigue Analysis; ASME Boiler and Pressure Vessel (B&PV) Code, Section VIII, Division 1, Rules for Construction of Pressure Vessels, American Society of Mechanical Engineers; ASME Boiler and Pressure Vessel (B&PV) Code, Section VIII, Division 2, Alternative Rules, American Society of Mechanical Engineers</p>	<p>The Material Requisitions require use of the Engineering Specification for Pressure Vessel Design and Fabrication for vessels RLD-VSL-00002/-00007/ and -00008. This specification requires that the vessels and all vessel appurtenances are to be designed to ASME B&PV Code, Section VIII, Division 1 rules. Additional supplementary requirements are specified in the specification for Pressure Vessel Design and Fabrication. These supplementary requirements address pressure vessel fatigue analysis, positive material identification, standard fabrication tolerances, acceptable welding procedures for the vessel and appurtenances, welder qualifications and testing records, NDE inspections and records, quality assurance requirements, and packaging, shipping, handling and storage requirements. Two of the vessels have internal equipment (RLD-VSL-00007 & -00008) that is subject to cyclic loading, e.g., pulse jet mixers and charge vessels. The Engineering Specification for Pressure Vessel Fatigue Analysis requires use of the fatigue design standards in ASME B&PV Code, Section VIII, Division 2, which are appropriate for components with a high number of load cycles. The Mechanical Data Sheets identify Seismic Categories and Quality Levels for each vessel: RLD-VSL-00007, Seismic Category (SC-II), Quality Level (QL-2); RLD-VSL-00008, Seismic Category (SC-I), Quality Level (QL-1); and RLD-VSL-00002, Seismic Category (SC-III), Quality Level (CM)(Commercial Materials). Seismic Categories and Quality Levels are explained in the Engineering Specification for Pressure Vessel Design and Fabrication. These are adequate and acceptable codes and standards for design and fabrication of these RLD system vessels.</p>

High-Level Waste (HLW) Facility Radioactive Liquid Waste Disposal System (RLD) Vessels RLD-VSL-00002/-00007/ and -00008				COGEMA-IA-068, Rev. 0			
Information Assessed		Source of Information		Assessment			
Design	If a non-standard vessel is to be used, the design calculations demonstrate sound engineering principles of construction.	24590-WTP-3PS-MV00-T0001, Rev. 1, Engineering Specification for Pressure Vessel Design and Fabrication; Specification Change Notice (SCN) No. 24590-WTP-3PN-MV00-00006 for Engineering Specification for Pressure Vessel Design and Fabrication		The Engineering Specification for Pressure Vessel Design and Fabrication requires that the RLD System vessels RLD-VSL-00002/-00007/ and -00008, are to be designed and fabricated in accordance with the requirements of ASME B&PV Code, Section VIII, Division 1. The vessels are to be delivered after design, fabrication, inspection and testing with ASME U stamps and the vessels will be registered with the National Board. These are shop fabricated vessels for mixed waste service in the HLW Facility.			

High-Level Waste (HLW) Facility Radioactive Liquid Waste Disposal System (RLD) Vessels RLD-VSL-00002/-00007/ and -00008

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Information Assessed	Source of Information	Assessment
<p>Design</p> <p>Vessel has adequate strength, after consideration of the corrosion allowance, to withstand the operating pressure, operating temperature, and seismic loads.</p>	<p>Drawings, Material Requisitions and Mechanical Systems Data Sheets listed above under References; 24590-WTP-3PS-MV00-T0001, Rev. 1, Engineering Specification for Pressure Vessel Design and Fabrication; Specification Change Notice (SCN) No. 24590-WTP-3PN-MV00-00006 for Engineering Specification for Pressure Vessel Design and Fabrication; 24590-WTP-3PS-MV00-T0002, Engineering Specification for Seismic Qualification Criteria for Pressure Vessels (Rev. 1, RLD-VSL-00002)(Rev. 2, RLD-VLS-00007 & -00008); 24590-WTP-3PS-SS90-T0001, Rev. 0, Engineering Specification for Seismic Qualification of Seismic Category I/II Equipment and Tanks; 24590-WTP-3PS-FB01-T0001, Rev. 1, Engineering Specification for Structural Design Loads for Seismic Category III & IV Equipment and Tanks; UBC, 1997, Uniform Building Code, International Conference of Building Officials</p>	<p>The Engineering Specification for Pressure Vessel Design and Fabrication requires that the RLD vessels are to be designed to ASME B&PV Code, Section VIII, Division 1 rules. This code requires specific consideration of the operating pressures, temperatures, seismic loads, and corrosion allowance in the design process. Supplementary general design criteria are specified in the Engineering Specification for Seismic Qualification Criteria for Pressure Vessels. The Mechanical Systems Data Sheets identify the operating pressure and temperature ranges for each vessel, the materials selected in the corrosion report, the corrosion allowance, and the requirements for seismic qualification in the design. The Mechanical Systems Data Sheets indicate that vessels RLD-VSL-00007/ and -00008 are to be analyzed as SC-I/II vessels. The Engineering Specification for Seismic Qualification of Seismic Category I/II Equipment and Tanks provides detailed guidance for the seismic analyses. The Data Sheet indicates the RLD-VSL-00002 is to be analyzed as a SC-III vessel. The Engineering Specification for Structural Design Loads for Seismic Category III & IV Equipment and Tanks provides detailed guidance for this seismic analysis which requires use of the seismic design requirements in the 1997 UBC. These are appropriate codes and criteria to ensure the tanks have adequate strength at the end of their design lives.</p>
<p>Foundations</p> <p>Vessel foundation will maintain the load of a full vessel.</p>	<p>Drawings listed above under References; 24590-WTP-3PS-MV00-T0001, Rev. 1, Engineering Specification for Pressure Vessel Design and Fabrication; Specification Change Notice (SCN) No. 24590-WTP-3PN-MV00-00006 for Engineering Specification for Pressure Vessel Design and Fabrication</p>	<p>The Equipment Assembly drawings show the support arrangements for each of the RLD vessels. All the vessels are provided with cylindrical skirts. The Engineering Specification for Pressure Vessel Design and Fabrication provides requirements that assure adequate vessel skirt foundation designs.</p>

High-Level Waste (HLW) Facility Radioactive Liquid Waste Disposal System (RLD)

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Vessels RLD-VSL-00002/-00007/ and -00008

Information Assessed		Source of Information	Assessment
Foundations	If in an area subject to flooding, the vessel is anchored.	24590-WTP-3PS-MV00-T0001, Rev. 1, Engineering Specification for Pressure Vessel Design and Fabrication; Specification Change Notice (SCN) No. 24590-WTP-3PN-MV00-00006 for Engineering Specification for Pressure Vessel Design and Fabrication	Buoyant forces of an empty vessel in a flooded room are a mandatory standard design load case in the Engineering Specification for Pressure Vessel Design and Fabrication.
Frost Heave	Vessel system will withstand the effects of frost heave.	Drawings and System Description listed above under References 24590-WTP-DC-ST-01-001, Rev. 3, Structural Design Criteria	The System Description identifies that the RLD system vessels RLD-VSL-00002/-00007/ and -00008 are located in the Wet Process Cell at elevation (-) 21'-0". This room is supported by the HLW Building mat foundation. The Structural Design Criteria requires that all structural foundations extend into the surrounding soil below the frost line in order to preclude frost heave. The frost line is located 30 in. below finished grade. Therefore the RLD system vessels will not be subject to frost heave.

High-Level Waste (HLW) Facility Radioactive Liquid Waste Disposal System (RLD) Vessels RLD-VSL-00002/-00007/ and -00008

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Information Assessed	Source of Information	Assessment
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<p>Characteristics of the waste to be stored or treated have been identified (ignitable, reactive, toxic, specific gravity, vapor pressure, flash point, storage temperature)</p>	<p>Drawings, Mechanical Systems Data Sheets and System Description listed above under References; 24590-WTP-PER-PR-03-002, Rev. 1, Toxic Vapors and Emissions from WTP Tank Systems and Miscellaneous Treatment Unit Systems; 24590-WTP-PER-PR-03-001, Rev. 1, Prevention of Hydrogen Accumulation in WTP Tank Systems and Miscellaneous Treatment Unit Systems</p>	<p>The System Description describes the characteristics of the waste handled in each of the RLD system vessels. The primary functions of all the tanks are confinement of the waste during normal operations, abnormal operations, and during and after a design level seismic event as discussed in the Toxic Vapors and Emissions from WTP Tank Systems document. RLD-VSL-00002 receives effluent condensate from low point drains in the primary offgas lines downstream from the High Efficiency Mist Eliminators (HEMEs). This waste contains no solids and the pH may range from about 2.5 to 6.5. The Acidic Waste Vessel, RLD-VSL-00007, will receive melter offgas condensate and particulates from the Submerged Bed Scrubbers (SBS), the SBS condensate receiver vessels, the wet electrostatic precipitators (WESPs) and the HEME's. This waste is normally acidic with a pH of about 2. Waste in this tank is neutralized with the addition of NaOH to a pH of about 14 prior to transfers to the Pretreatment Facility. Wastes handled in RLD-VSL-00002 & -00007 are not a concern for flammability or ignitability. The Plant Wash and Drains Vessel, RLD-VSL-00008, collects vessel overflows, sump drains, wash water from cells, and fire protection water with a pH of about 8 to 13. RLD-VSL-00008 is provided with hydrogen mitigation and purge mixing systems as discussed in the Prevention of Hydrogen Accumulation in WTP Tank Systems document. The vessels are furnished with grounding lugs to control the discharge of static electricity as shown on the drawings. All of the vessels are equipped with internal wash rings for decontamination.</p>
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High-Level Waste (HLW) Facility Radioactive Liquid Waste Disposal System (RLD)
Vessels RLD-VSL-00002/-00007/ and -00008

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Information Assessed Source of Information

Assessment

<p>The System Description document describes the normal waste operations for the RLD system vessels. The Offgas Drains Collection Vessel, RLD-VSL-00002, doesn't receive any treatment reagents. The Plant Item Material Selection Data Sheet for this vessel lists 316 stainless steel, (maximum 0.030% Carbon; dual certified), hereinafter referred to as 316L stainless steel, as the appropriate material choice for this vessel. The Acidic Waste Vessel, RLD-VSL-00007, normally operates with acidic melter offgas condensate waste. This tank receives NaOH to neutralize the acidic waste prior to transfers to the Pretreatment Facility. The Plant Item Material Selection Data Sheet for this vessel lists UNS N08367/N08926, hereinafter referred to as 6% Mo, as an appropriate material choice for this vessel. The Data Sheet indicates that steam ejectors and piping in this vessel will be Hastelloy C-22 (UNS N06022) material for additional corrosion resistance. The Plant Wash and Drains Vessel, RLD-VSL-00008 normally receives neutral to slightly caustic washes from C3/C5 area drains and sumps. NaOH is added to this tank to adjust the pH prior to transfers to the Pretreatment Facility. The Plant Item Material Selection Data Sheet for this vessel lists 316L stainless steel as the appropriate material choice for this vessel. The Data Sheet indicates that steam ejectors and piping will be Hastelloy C-22 (UNS N06022) material for additional corrosion resistance.</p> <p>The RLD System Description document identifies that the only liquids used in vessels RLD-VSL-00002/-00007/ and -00008 are the wastes described above and NaOH reagent. These wastes are compatible and the vessel material selections consider both the waste characteristics and the reagent characteristics.</p>	<p>The System Description document describes the normal waste operations for the RLD system vessels. The Offgas Drains Collection Vessel, RLD-VSL-00002, doesn't receive any treatment reagents. The Plant Item Material Selection Data Sheet for this vessel lists 316 stainless steel, (maximum 0.030% Carbon; dual certified), hereinafter referred to as 316L stainless steel, as the appropriate material choice for this vessel. The Acidic Waste Vessel, RLD-VSL-00007, normally operates with acidic melter offgas condensate waste. This tank receives NaOH to neutralize the acidic waste prior to transfers to the Pretreatment Facility. The Plant Item Material Selection Data Sheet for this vessel lists UNS N08367/N08926, hereinafter referred to as 6% Mo, as an appropriate material choice for this vessel. The Data Sheet indicates that steam ejectors and piping in this vessel will be Hastelloy C-22 (UNS N06022) material for additional corrosion resistance. The Plant Wash and Drains Vessel, RLD-VSL-00008 normally receives neutral to slightly caustic washes from C3/C5 area drains and sumps. NaOH is added to this tank to adjust the pH prior to transfers to the Pretreatment Facility. The Plant Item Material Selection Data Sheet for this vessel lists 316L stainless steel as the appropriate material choice for this vessel. The Data Sheet indicates that steam ejectors and piping will be Hastelloy C-22 (UNS N06022) material for additional corrosion resistance.</p>
<p>The waste types are compatible with each other.</p>	<p>System Description listed above under References</p>

High-Level Waste (HLW) Facility Radioactive Liquid Waste Disposal System (RLD) Vessels RLD-VSL-00002/-00007/ and -00008			COGEMA-IA-068, Rev. 0
Information Assessed	Source of Information	Assessment	

Corrosion	Vessel material and protective coatings ensure the vessel structure is adequately protected from the corrosive effects of the waste stream and external environments (expected to not leak or fail for the design life of the system)	Mechanical Systems Data Sheets, Plant Item Material Selection Data Sheets and System Descriptions listed above under References	The Plant Item Material Selection Data Sheet for RLD-VSL-00002 lists 316L stainless steel as the appropriate material choice for this vessel for a 40 year service life. The Plant Item Material Selection Data Sheet for RLD-VSL-00007 lists 6% Mo as an appropriate material choice for this vessel for a 40 year service life. The Plant Item Material Selection Data Sheet for RLD-VSL-00008 lists 316L stainless steel as the appropriate material choice for this vessel for a 40 year service life. The material selections all provide for a corrosion allowance. These material selections are adequate to provide the required 40 year service life for these vessels.
	Corrosion allowance is adequate for the intended service life of the vessel.	Drawings, Mechanical Systems Data Sheets and Plant Item Material Selection Data Sheets listed above under References	The Plant Item Material Selection Data Sheet for RLD-VSL-00002 lists 316L stainless steel as the appropriate material choice for this vessel with a 0.040 in. corrosion allowance for a 40 year service life. The Plant Item Material Selection Data Sheet for RLD-VSL-00007 lists 6% Mo as an appropriate material choice for this vessel with a 0.040 in. corrosion allowance for a 40 year service life. The Plant Item Material Selection Data Sheet for RLD-VSL-00008 lists 316L stainless steel as the appropriate material choice for this vessel with a 0.040 in. corrosion allowance for a 40 year service life. These material selections and corrosion allowances assure an adequate service life for the vessels.
Pressure Relief	Pressure controls (vents and relief valves) are adequately designed to ensure pressure relief if normal operating pressures in the vessel are exceeded.	Drawings and System Description listed above under References	The System Description identifies that vessels RLD-VSL-00002 & -00008 overflow to the sump in the Wet Process Cell. Vessel RLD-VSL-00007 overflows to RLD-VSL-00008. The Equipment Assembly drawings show that the overflow lines are larger than any of the other liquid conveying lines entering the vessels and therefore have adequate flow capacity to preclude overpressure.